

Listing of Claims

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims **1-2.**(canceled)

3.(currently amended) ~~The processing system as claimed in claim 1, further comprising:~~
A semiconductor wafer processing system having a vacuum environment therein and comprising:

a semiconductor wafer processing module having a wafer holder therein configured to hold a semiconductor wafer for processing in the vacuum environment, the processing module also having mounting structure therein configured to removably mount a maintenance item in the vacuum environment in the processing module and to present the maintenance item for pick up therefrom or to accept the maintenance item for placement thereon by a wafer transfer mechanism;

a maintenance item removably mounted on the mounting structure;

a transfer system having a transfer mechanism therein operable to transfer either a semiconductor wafer by wafer handling motions within the vacuum environment between the transfer system and the processing module for processing on the wafer holder, or to transfer a maintenance item by wafer handling motions within the vacuum environment between the mounting structure in the processing module and the transfer system without exposing the processing module to an outside environment; and

a maintenance system comprising a storage assembly storing at least one maintenance item and an exchange system for transferring a maintenance item between the transfer system and the maintenance system without exposing the vacuum environment to an outside environment.

4.(original) The processing system as claimed in claim **3**, further comprising:
an isolation assembly coupled between the maintenance system and the transfer system, the isolation assembly comprising a gate valve assembly.

5.(original) The processing system as claimed in claim **3**, wherein the exchange system comprises:

a drive system, a transfer arm coupled to the drive system, and an end effector coupled to the transfer arm, the drive system being used to move the transfer arm and the end effector in at least one direction in order to transfer the removably mounted maintenance item between the maintenance system and the processing module.

6.(original) The processing system as claimed in claim **3**, wherein the exchange system comprises:

a drive system, a transfer arm coupled to the drive system, and an end effector coupled to the transfer arm, the drive system being used to move the transfer arm and the end effector to transfer the substrate between a transfer plate in the transfer system and a substrate holder in the processing module.

7.(previously presented) The processing system as claimed in claim **3**, wherein:

the maintenance system includes a storage assembly; and

the exchange system comprises a drive system, a transfer arm coupled to the drive system, and an end effector coupled to the transfer arm, the drive system being used to move the transfer arm and the end effector to transfer the removably mounted maintenance item between the transfer system and the storage assembly in the maintenance system.

Claim **8.(canceled)**

9.(currently amended) ~~The processing system as claimed in claim **1**, wherein~~

A semiconductor wafer processing system having a vacuum environment therein and comprising:

a semiconductor wafer processing module having a wafer holder therein configured to hold a semiconductor wafer for processing in the vacuum environment, the processing module also having

mounting structure therein configured to removably mount a maintenance item in the vacuum environment in the processing module and to present the maintenance item for pick up therefrom or to accept the maintenance item for placement thereon by a wafer transfer mechanism;

a maintenance item removably mounted on the mounting structure;

a transfer system having a transfer mechanism therein operable to transfer either a semiconductor wafer by wafer handling motions within the vacuum environment between the transfer system and the processing module for processing on the wafer holder, or to transfer a maintenance item by wafer handling motions within the vacuum environment between the mounting structure in the processing module and the transfer system without exposing the processing module to an outside environment; and

the maintenance item ~~comprises~~ comprising at least one of a ring, a shield, an insulator, an adapter, a baffle, and a plate.

10.(currently amended) ~~The processing system as claimed in claim 1, further comprising:~~

A semiconductor wafer processing system having a vacuum environment therein and comprising:

a semiconductor wafer processing module having a wafer holder therein configured to hold a semiconductor wafer for processing in the vacuum environment, the processing module also having mounting structure therein configured to removably mount a maintenance item in the vacuum environment in the processing module and to present the maintenance item for pick up therefrom or to accept the maintenance item for placement thereon by a wafer transfer mechanism;

a maintenance item removably mounted on the mounting structure;

a transfer system having a transfer mechanism therein operable to transfer either a semiconductor wafer by wafer handling motions within the vacuum environment between the transfer system and the processing module for processing on the wafer holder, or to transfer a maintenance item by wafer handling motions within the vacuum environment between the mounting structure in the processing module and the transfer system without exposing the processing module to an outside environment; and

a controller coupled to the processing module and the transfer system, the controller being programmed to control the processing module and the transfer system to replace the maintenance item on the mounting structure without exposing the processing module to an outside environment.

Claims **11-12.**(canceled)

13.(currently amended) ~~The processing system of claim 1 wherein:~~

A semiconductor wafer processing system having a vacuum environment therein and comprising:

a semiconductor wafer processing module having a wafer holder therein configured to hold a semiconductor wafer for processing in the vacuum environment, the processing module also having mounting structure therein configured to removably mount a maintenance item in the vacuum environment in the processing module and to present the maintenance item for pick up therefrom or to accept the maintenance item for placement thereon by a wafer transfer mechanism;

a maintenance item removably mounted on the mounting structure;

a transfer system having a transfer mechanism therein operable to transfer either a semiconductor wafer by wafer handling motions within the vacuum environment between the transfer system and the processing module for processing on the wafer holder, or to transfer a maintenance item by wafer handling motions within the vacuum environment between the mounting structure in the processing module and the transfer system without exposing the processing module to an outside environment; and

the mounting structure ~~[[is]]~~ being configured to move the maintenance item from a mounting position for use during processing into position for pick up by the transfer mechanism.

14.(original) The processing system of claim **13** wherein:

the maintenance item is an annular ring configured to surround a wafer on a wafer support;

the mounting structure includes a set of lift pins operable to lift the ring into position for pick up by a wafer transfer arm.

15.(original) The processing system of claim **13** wherein:
the maintenance item is supported within the processing module from the top of the processing module;
the mounting structure includes a set of elements for releaseably holding the maintenance item and operable to lower the maintenance item into position for pick up by a wafer transfer arm.

16.(original) The processing system of claim **13** wherein:
the transfer mechanism includes a wafer transfer arm and a separate transfer arm configured to pick up a maintenance item.

17.(currently amended) ~~The processing system as claimed in claim 1, wherein~~
A semiconductor wafer processing system having a vacuum environment therein and comprising:
a semiconductor wafer processing module having a wafer holder therein configured to hold a semiconductor wafer for processing in the vacuum environment, the processing module also having mounting structure therein configured to removably mount a maintenance item in the vacuum environment in the processing module and to present the maintenance item for pick up therefrom or to accept the maintenance item for placement thereon by a wafer transfer mechanism;
a maintenance item removably mounted on the mounting structure;
a transfer system having a transfer mechanism therein operable to transfer either a semiconductor wafer by wafer handling motions within the vacuum environment between the transfer system and the processing module for processing on the wafer holder, or to transfer a maintenance item by wafer handling motions within the vacuum environment between the mounting structure in the processing module and the transfer system without exposing the processing module to an outside environment; and
the processing module ~~comprises~~ comprising at least one of an ALD module, a deposition module, a coating module, a patterning module, a developing module, a metrology module, a thermal processing module, and a cleaning module.

Claims **18-28.**(canceled)

29.(previously presented) A method of operating a semiconductor wafer processing system comprising:

coupling a processing module having a first maintenance item removably mounted therein in a processing position that exposes the item to wear or contamination due to a process performed on a semiconductor wafer in the processing module, to an exchange system using a first isolation assembly;

coupling the exchange system to a maintenance system using a second isolation assembly;

vertically moving the maintenance item into a transfer position within the processing module for pick up of the first maintenance item from the processing module by the wafer transfer arm;

transferring the first maintenance item from the processing module to the maintenance system through the first and second isolation assemblies without exposing the processing module and the first maintenance item to an outside environment;

transferring a second maintenance item from the maintenance system to the processing module through the first and second isolation assemblies without exposing the processing module and the second maintenance item to an outside environment; and

removably mounting the second maintenance item to the processing module.

Claims **30-33.**(canceled)